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ABSTRACT

The longitudinal Guttman simplex (LGS), a method of modeling stage sequences or levels over time, allows for individual differences in sequence progression or development. The LGS is particularly appropriate in modeling tobacco, alcohol, and marijuana use stages with adolescent subjects where relationships among drugs and degree of involvement may be explored. To examine adolescent substance use, data were obtained from junior high school students (N=541) in the Los Angeles, California area who were part of a 5-year substance abuse prevention program. Psychosocial constructs and drug use were measured for this phase while students were in grade 7 (1983) and grade 9 (1985). The results revealed that a relatively sizable percentage of variability in substance use as measured by a LGS could be accounted for by psychosocial scales measured one year prior to use assessment. Analyses suggest that a student's self-report of the number of friends who use, and the student's intention to use drugs, related to increased use one year later. The strongest, consistent predictor of substance use identified (friends who use substances) may not be easily modified by preventive interventions. Constructs identified as indirectly predicting use, such as prevalence estimates and perceived consequences of use may be amenable to change as a result of prevention programming. (NB)

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# Predicting a longitudinal Guttman simplex of adolescent substance use

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When attempting to model tobacco, alcohol, and marijuana use by young adolescents one is faced with three correlated behaviors, each of which can be characterized as having few students at high use levels, some showing moderate use, and the majority of students exhibiting little or no regular use of the three drugs. Common methods of analyzing substance use have included: a) aggregation by averaging across substances for a single composite score, b) canonical correlation analysis (e.g. Huba, Wingard and Bentler, 1980) and c) cross-sectional Guttman scaling (e.g. Kandel, 1975).

A single composite of the three drugs makes analysis manageable, but does not model underlying relationships among them. Canonical correlation is appropriate for correlated dependent variables, but cannot model development or change over time.

The longitudinal Guttman simplex (LGS) is a method of modelling stage sequences, or levels, over time. It allows for individual differences in sequence progression or development. The LGS is particularly appropriate in modelling substance use stages with young subjects where relationships among drugs and degree of involvement may be explored. One advantage to its use as a dependent variable is that, as found in the data presented for this study, it was found to be less skewed than were the substance items from which it was formed.

## Methods

### Subjects

Data for the present study were taken from junior high school students in the Los Angeles area who were part of a five-year substance use prevention program. Students were first measured while in grade 7 in 1983 (time 0) and were followed to grade 9 in 1985 (time 2). White students only were selected for these analyses as previous research found the most reliable scaling of substance use for this group. These students were assigned randomly to one of two samples (N1 = 255, N2 = 286) for analysis and cross-validation.

## Psychosocial measures

Psychosocial contructs were measured by scales of self-reported items previously developed by Graham et.al.(1984). Fourteen predictors were selected because of demonstrated reliability of the indices. The psychosocial measures included: estimated drug use by peers and adults, drug use by friends and parents, perceived positive and negative consequences of drug use, risk-taking/rebelliousness, previous behavior problems in school, communication skills, talking with parents about problems, intentions to use drugs if offered, availability of substances, and SES level.

## Drug use measure

A longitudinal Guttman simplex of substance use was developed and cross-validated on students from a previous, independent cohort (Collins et. al., 1986). Analyses indicated that the most reliable scaling of items over times was found for white junior high school students. The data suggested that a single scaling of experimental use across the three drugs-tobacco, alcohol, and marijuana- best described the substance use acquisition process for this age group. The resulting scale of items measured at Time 2 was used as the dependent variable for this study (tables 1 and 2).

## Analyses

A multiple regression analysis was used, entering all psychosocial variables into the equation simultaneously to predict level of substance use for the first "criterion" sample. Due to the questionnaire design, a direct cross-validation-- i.e., employing the unstandardized coefficients calculated on the first sample in the prediction equation for the second sample-- was not possible. Instead the same analysis, regression of substance use at time 2 on psychosocial predictors measured at time 1, was conducted for the second group. The resulting coefficients, $R^2$, and adjusted $R^2$ were compared against the results from the first sample.

# Results

Fifty-three percent of the variability in substance use was predicted by the full regression model in sample 1 (table 3). Adjusting this measure for the number of subjects and independent variables included in the equation, 51% of the variance in substance use was predicted prospectively. Half of the psychosocial measures were found to be significant at $p < .01$.

Replication of the analysis on sample 2 resulted in 55% of the variability in substance use accounted for by the full model, and an adjusted $R^2$ of 53%. The two strongest predictors from the first sample, intention to use drugs and number of friends who use, were found to be significant ($p < .01$) in the second sample as well.

Moderate to high intercorrelations among the predictors were noted for each sample; thus an attempt to model the relationships among these constructs was accomplished by regressing the two significant predictors measured at time 1 on the remaining psychosocial measures taken at time 0 (table 4). It was found that intentions to use drugs was predicted by perceived positive consequences of use, risk-taking, lower estimates of adult use, higher estimates of peer use, and prior behavior problems at school ($R^2 = .44$, adj $R^2 = .42$). The number of friends who use was predicted by prior behavior problems at school and drug availability at time 0 ($R^2 = .30$ , adj $R^2 = .28$).

## Discussion

It was found that a relatively sizable percentage of variability in substance use as measured by a longitudinal Guttman simplex could be accounted for by psychosocial scales measured one year prior to use assessment. A direct cross-validation could not be performed with these data; however these analyses suggest that a student's self-report of the number of friends who use, and the student's intention to use drugs related to increased use one year later.

Prior substance use was not used as a predictor in these analyses. While it has been found with these and other data that past use is a strong predictor of future use, its inclusion in the model would be at the expense of possible suppression of psychosocial predictors (Downs, 1987). Subsequent analyses of these data would select subjects at one level, keeping prior use constant, and identify predictors of initiation or increased use for these students.

The strongest, consistent predictors of substance use identified here may not be easily modified by preventive interventions. While changing a student's intentions to use drugs might be accomplished (as evidenced by recent campaigns to "just say no"), changing a student's friends or the number of friends who already use these substances may be more difficult. However, those constructs which indirectly predict use, such as prevalence estimates and perceived consequences of use, may be more amenable to change as a result of prevention programming.

## References


Collins, L.M., Dent, C.W., Graham, J.W., McGuigan, K.A., Hansen, W.B., Flay, B.R., and Johnson, C.A. (1986). Stage sequences of substance use in adolescence: applying LGS methodology to three longitudinal data bases. Institute for Prevention Research technical report 86-101.

Downs, W.R. (1987) A panel study of normative structure, adolescent alcohol use and peer alcohol use. Journal of Studies on Alcohol,48(2),167-175.

Graham, J.W., Sobel, J.L., Grossman, L.M., Flay, B.R., Hansen, W.B., and Johnson, C.A. (1985). Reliability of self-report measures in drug abuse prevention research: Evaluation of the psychosocial measures in the project SMART questionnaire. Institute for Prevention Research technical report.

Huba,G.J., Wingard, J.A., and Bentler, P.M. (1980). Longitudinal analysis of the role of peer support, adult models, and peer subcultures in beginning adolescent substance use: An application of setwise canonical correlation methods. Multivariate Behavioral Research,15, 259-280.

Kandel,D.B. (1975). Stages in adolescent involvement in drug use. Science, 190, 912-914.

Table 1: Levels of use for "criterion" sample 1

| | Time 1 (%) | Time 2 (%) |
|---|---|---|
| 0. abstain from any use | 18 (7.1) | 12 (4.7) |
| 1. try alcohol | 36 (14.1) | 24 (9.4) |
| 2. try cigarettes | 21 (8.2) | 14 (5.5) |
| 3. > 1 drink lifetime | 20 (7.8) | 25 (9.8) |
| 4. drunk at least once | 18 (7.1) | 15 (5.9) |
| 5. > 1 cig lifetime | 23 (9.0) | 22 (8.6) |
| 6. try marijuana | 8 (3.1) | 8 (3.1) |
| 7. any cig past month | 12 (4.7) | 11 (4.3) |
| 8. > 1 use marijuana lifetime | 7 (2.7) | 6 (2.4) |
| 9. > 1 cig past month | 8 (3.1) | 3 (1.2) |
| 10. > 1 pack cig lifetime | 20 (7.8) | 28 (11.0) |
| 11. any marijuana past month | 7 (2.7) | 5 (2.0) |
| 12. > 10 uses marijuana life | 3 (1.2) | 16 (6.3) |
| 13. > 1 use marijuana past month | 2 (0.8) | 10 (3.9) |
| 14. more current smoking | 23 (9.0) | 11 (4.3) |
| 15. any marijuana past week | 29 (11.4) | 45 (17.6) |
| total | 255 (100) | 255 (100) |
| mean | 6.6 | 7.8 |

Table 2: Levels of use for "cross-validation" sample 2

| | Time 1 (%) | Time 2 (%) |
|---|---|---|
| 0. abstain from any use | 20 (7.0) | 14 (4.9) |
| 1. try alcohol | 53 (18.6) | 35 (12.2) |
| 2. try cigarettes | 25 (8.8) | 9 (3.1) |
| 3. > 1 drink lifetime | 28 (9.8) | 30 (10.5) |
| 4. drunk at least once | 22 (7.7) | 20 (7.0) |
| 5. > 1 cig lifetime | 20 (7.0) | 25 (8.7) |
| 6. try marijuana | 11 (3.9) | 14 (4.9) |
| 7. any cig past month | 9 (3.2) | 8 (2.8) |
| 8. > 1 use marijuana lifetime | 7 (2.5) | 7 (2.4) |
| 9. > 1 cig past month | 10 (3.5) | 7 (2.4) |
| 10. > 1 pack cig lifetime | 23 (8.1) | 31 (10.8) |
| 11. any marijuana past month | 3 (1.1) | 11 (3.8) |
| 12. > 10 uses marijuana life | 4 (1.4) | 7 (2.4) |
| 13. > 1 use marijuana past month | 1 (0.4) | 8 (2.8) |
| 14. more current smoking | 20 (7.0) | 10 (3.5) |
| 15. any marijuana past week | 29 (10.2) | 50 (17.5) |
| total | 286 (100) | 286 (100) |
| mean | 5.9 | 7.4 |

Table 3: Prediction of substance use at Time 2 (one year post-test) using psychosocial measures at Time 1

| Psychosocial predictor | standardized regression coefficients | |
|---|---|---|
| | sample 1 | sample 2 |
| Intentions to use drug if offered | .47** | .41** |
| Number of close friends who use | .30** | .18* |
| Perceived negative health effects of use | -.18* | -.09 |
| Talk with parents about problems | -.16* | .08 |
| Communication skill | -.15* | .11 |
| Estimates of peer substance use | -.19* | -.14 |
| High SES | .18** | .03 |
| $R^2$ = | .54 | .55 |
| Adjusted $R^2$ = | .51 | .53 |

* $p < .01$
** $p < .001$

Table 4: Prediction of "Intention to use" and "Number of friends who use" at Time 1 from psychosocial measures at Time 0 (one year prior)

| Intention to use if offered | standardized regression coefficient |
|---|---|
| perceived positive consequences of use | .32*** |
| risk-taking/rebelliousness | .24*** |
| estimates of peer use | .17* |
| estimates of adult use | -.30*** |
| been in trouble at school | .15* |

$R^2 = .44$

Adjusted $R^2 = .42$

* p < .01
** p < .0001

| Number of friends use | standardized regression coefficient |
|---|---|
| availability of substances | .26*** |
| been in trouble at school | .30*** |

$R^2 = .30$

Adjusted $R^2 = .28$

*** p < .0001